THE LEPTON, QUARK AND HADRON CURRENTS

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Abstract

The Clifford pentads of the 4X4 complex matrices define the current vectors of the particles. The weak isospin transformation divides the particles on two components, which scatter in the 2-dimensional antidiagonal Clifford matrices space. A physics objects move in the 3-dimensional diagonal Clifford matrices space. This sectioning of the 5-dimensional space on the 3-dimensional and the 2-dimensional subspaces defines the Newtonian gravity principle.

The Clifford pentads sextet contains single light pentad and three chromatic pentads. The Cartesian frame rotations confound the chromatic pentads. The combination of the chromatic particles (the hadron monad) exists, which behaves as the particle for such rotations .

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Contents

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Use the natural metric: $\hbar = c = 1$.

1 INTRODUCTION

In the Quantum Theory the fermion behavior is depicted by the spinor Ψ. The probability current vector $\overrightarrow{j}$ components of this fermion are the following:

$$j_x = \Psi^\dagger \cdot \beta^1 \cdot \Psi, j_y = \Psi^\dagger \cdot \beta^2 \cdot \Psi, j_z = \Psi^\dagger \cdot \beta^3 \cdot \Psi. \tag{1}$$

Here

$$\beta^1 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 \\ 0 & 0 & -1 & 0 \end{bmatrix}, \beta^2 = \begin{bmatrix} 0 & -i & 0 & 0 \\ i & 0 & 0 & 0 \\ 0 & 0 & 0 & i \\ 0 & 0 & -i & 0 \end{bmatrix},$$

$$\beta^3 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}.$$

are the members of the Clifford pentad, for which other members are the following:

$$\gamma^0 = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \text{ and } \beta^4 = \begin{bmatrix} 0 & 0 & i & 0 \\ 0 & 0 & 0 & i \\ -i & 0 & 0 & 0 \\ 0 & -i & 0 & 0 \end{bmatrix}.$$

Let this spinor be expressed in the following form:

$$\Psi = |\Psi| \cdot \begin{bmatrix} \exp(i \cdot g) \cdot \cos(b) \cdot \cos(a) \\ \exp(i \cdot d) \cdot \sin(b) \cdot \cos(a) \\ \exp(i \cdot f) \cdot \cos(v) \cdot \sin(a) \\ \exp(i \cdot q) \cdot \sin(v) \cdot \sin(a) \end{bmatrix}.$$

In this case the probability current vector $\overrightarrow{j}$ has got the following components:

$$
\begin{gathered}
j_x = |\Psi|^2 \cdot \\
\cdot \left[\cos^2(a) \cdot \sin(2 \cdot b) \cdot \cos(d-g) - \sin^2(a) \cdot \sin(2 \cdot v) \cdot \cos(q-f)\right], \\
j_y = |\Psi|^2 \cdot \\
\cdot \left[\cos^2(a) \cdot \sin(2 \cdot b) \cdot \sin(d-g) - \sin^2(a) \cdot \sin(2 \cdot v) \cdot \sin(q-f)\right], \\
j_z = |\Psi|^2 \cdot \left[\cos^2(a) \cdot \cos(2 \cdot b) - \sin^2(a) \cdot \cos(2 \cdot v)\right].
\end{gathered} \tag{2}
$$

If

$$\rho = \Psi^\dagger \cdot \Psi,$$

then ρ is the probability density, i.e.$\int\int\int_{(V)} \rho(t) \cdot dV$ is the probability to find the particle with the state function Ψ in the domain V of the 3-dimensional space at the time moment t. In this case, $\{\rho, \overrightarrow{j}\}$ is the probability density $3+1$-vector.

If

$$\overrightarrow{j} = \rho \cdot \overrightarrow{u}, \tag{3}$$

then $\overrightarrow{u}$ is the average velocity for this particle.

Let us denote:

$$J_0 = \Psi^\dagger \cdot \gamma^0 \cdot \Psi, J_4 = \Psi^\dagger \cdot \beta^4 \cdot \Psi, J_0 = \rho \cdot V_0, J_4 = \rho \cdot V_4. \tag{4}$$

In this case:

$$
\begin{gathered}
V_0 = \sin(2 \cdot a) \cdot [\cos(b) \cdot \cos(v) \cdot \cos(g-f) + \sin(b) \cdot \sin(v) \cdot \cos(d-q)], \\
V_4 = \sin(2 \cdot a) \cdot [\cos(b) \cdot \cos(v) \cdot \sin(g-f) + \sin(b) \cdot \sin(v) \cdot \sin(d-q)];
\end{gathered} \tag{5}
$$

and for every particle:

$$u_x^2 + u_y^2 + u_z^2 + V_0^2 + V_4^2 = 1. \tag{6}$$

For the left particle (for example, the left neutrino): $a = \frac{\pi}{2}$,

$$\Psi_L = |\Psi_L| \cdot \left[\begin{array}{c} 0 \\ 0 \\ \exp(i \cdot f) \cdot \cos(v) \\ \exp(i \cdot q) \cdot \sin(v) \end{array}\right]$$

and from (2), and (3): $u_x^2 + u_y^2 + u_z^2 = 1$.Hence, the left particle velocity equals 1; hence, the mass of the left particle equals to zero.

Let U be the weak global isospin (SU(2)) transformation with the eigenvalues $\exp(i \cdot \lambda)$.

In this case for this transformation eigenvector ψ:

$$U\psi = |\psi| \cdot \begin{bmatrix} \exp(i \cdot g) \cdot \cos(b) \cdot \cos(a) \\ \exp(i \cdot d) \cdot \sin(b) \cdot \cos(a) \\ \exp(i \cdot \lambda) \cdot \exp(i \cdot f) \cdot \cos(v) \cdot \sin(a) \\ \exp(i \cdot \lambda) \cdot \exp(i \cdot q) \cdot \sin(v) \cdot \sin(a) \end{bmatrix}$$

and for $1 \leq \mu \leq 3$ from (2):

$$(U\psi)^{\dagger} \cdot \beta^{\mu} \cdot (U\psi) = \psi^{\dagger} \cdot \beta^{\mu} \cdot \psi, \tag{7}$$

but for $\mu = 0$ and $\mu = 4$ from (5):

$$\begin{gathered} \psi^{\dagger} \cdot \gamma^{0} \cdot \psi = |\psi|^{2} \cdot \sin(2 \cdot a) \cdot \\ \left[\cos(b) \cdot \cos(v) \cdot \cos(g - f - \lambda) + \sin(b) \cdot \sin(v) \cdot \cos(d - q - \lambda)\right], \\ \psi^{\dagger} \cdot \beta^{4} \cdot \psi = |\psi|^{2} \cdot \sin(2 \cdot a) \cdot \\ \left[\cos(b) \cdot \cos(v) \cdot \sin(g - f - \lambda) + \sin(b) \cdot \sin(v) \cdot \sin(d - q - \lambda)\right]; \end{gathered} \tag{8}$$

2 THE WEAK ISOSPIN SPACE

In the weak isospin theory we have got the following entities (Global Symmetries, Standard Model):

the right electron state vector e_R,
the left electron state vector e_L,
the electron state vector e ($e = \begin{bmatrix} e_R \\ e_L \end{bmatrix}$),
the left neutrino state vector ν_L,
the zero vector right neutrino ν_R.
the unitary 2×2 matrix U of the isospin transformation.($\det(U) = 1$) (Gauge Symmetry).

This matrix acts on the vectors of the kind: $\begin{bmatrix} \nu_L \\ e_L \end{bmatrix}$.

Therefore, in this theory: if

$$U = \begin{bmatrix} u_{1,1} & u_{1,2} \\ u_{2,1} & u_{2,2} \end{bmatrix}$$

then the matrix

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & u_{1,1} & 0 & u_{1,2} \\ 0 & 0 & 1 & 0 \\ 0 & u_{2,1} & 0 & u_{2,2} \end{bmatrix}$$

operates on the vector

$$\begin{bmatrix} e_R \\ e_L \\ \nu_R \\ \nu_L \end{bmatrix}.$$

Because e_R, e_L, ν_R, ν_L are the two-component vectors then

$$\begin{bmatrix} e_R \\ e_L \\ \nu_R \\ \nu_L \end{bmatrix} \text{ is } \begin{bmatrix} e_{R1} \\ e_{R2} \\ e_{L1} \\ e_{L2} \\ 0 \\ 0 \\ \nu_{L1} \\ \nu_{L2} \end{bmatrix}$$

and

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & u_{1,1} & 0 & u_{1,2} \\ 0 & 0 & 1 & 0 \\ 0 & u_{2,1} & 0 & u_{2,2} \end{bmatrix} \text{ is } \underline{U} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & u_{1,1} & 0 & 0 & 0 & u_{1,2} & 0 \\ 0 & 0 & 0 & u_{1,1} & 0 & 0 & 0 & u_{1,2} \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & u_{2,1} & 0 & 0 & 0 & u_{2,2} & 0 \\ 0 & 0 & 0 & u_{2,1} & 0 & 0 & 0 & u_{2,2} \end{bmatrix}.$$

This matrix has got eight orthogonal normalized eigenvectors of kind:

$$\underline{s_1} = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \underline{s_2} = \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \underline{s_3} = \begin{bmatrix} 0 \\ 0 \\ \varpi \\ 0 \\ 0 \\ 0 \\ \chi \\ 0 \end{bmatrix}, \underline{s_4} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ \chi^* \\ 0 \\ 0 \\ 0 \\ -\varpi^* \end{bmatrix},$$

$$\underline{s_5} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \underline{s_6} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \underline{s_7} = \begin{bmatrix} 0 \\ 0 \\ \chi^* \\ 0 \\ 0 \\ 0 \\ -\varpi^* \\ 0 \end{bmatrix}, \underline{s_8} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ \varpi \\ 0 \\ 0 \\ 0 \\ \chi \end{bmatrix}.$$

The corresponding eigenvalues are: 1, 1, $\exp(i\cdot\lambda)$, $\exp(i\cdot\lambda)$, 1,1, $\exp(-i\cdot\lambda)$, $\exp(-i\cdot\lambda)$.

These vectors constitute the orthogonal basis in this 8-dimensional space.

Let $\underline{\gamma^0} = \begin{bmatrix} \gamma^0 & O \\ O & \gamma^0 \end{bmatrix}$, if O is zero 4×4 matrix, and $\underline{\beta^4} = \begin{bmatrix} \beta^4 & O \\ O & \beta^4 \end{bmatrix}$.

The vectors $\begin{bmatrix} e_{R1} \\ e_{R2} \\ e_{L1} \\ e_{L2} \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$, $\begin{bmatrix} e_{R1} \\ e_{R2} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 0 \\ e_{L1} \\ e_{L2} \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$ correspond to the state vectors e, e_R and e_L resp.

In this case (4) $\underline{e}^\dagger\cdot\underline{\gamma^0}\cdot\underline{e} = J_{0e}$, $\underline{e}^\dagger\cdot\underline{\beta^4}\cdot\underline{e} = J_{4e}$, $J_{0e} = \underline{e}^\dagger\cdot\underline{e}\cdot V_{0e}$, $J_{4e} = \underline{e}^\dagger\cdot\underline{e}\cdot V_{4e}$.

For the vector $\underline{e}$ the numbers k_3, k_4, k_7, k_8 exist, for which: $\underline{e} = (e_{R1}\cdot\underline{s_1} + e_{R2}\cdot\underline{s_2}) + (k_3\cdot\underline{s_3} + k_4\cdot\underline{s_4}) + (k_7\cdot\underline{s_7} + k_8\cdot\underline{s_8})$.

Here $\underline{e_R} = (e_{R1}\cdot\underline{s_1} + e_{R2}\cdot\underline{s_2})$. If $\underline{e_{La}} = (k_3\cdot\underline{s_3} + k_4\cdot\underline{s_4})$ and $\underline{e_{Lb}} = (k_7\cdot\underline{s_7} + k_8\cdot\underline{s_8})$ then $\underline{U}\cdot\underline{e_{La}} = \exp(i\cdot\lambda)\cdot\underline{e_{La}}$ and $\underline{U}\cdot\underline{e_{Lb}} = \exp(-i\cdot\lambda)\cdot\underline{e_{Lb}}$.

Let for all k $(1\le k\le 8)$: $\underline{h_k} = \underline{\gamma^0}\cdot\underline{s_k}$. The vectors $\underline{h_k}$ constitute the orthogonal basis, too. And the numbers q_3, q_4, q_7, q_8 exist, for which: $\underline{e_R} = (q_3\cdot\underline{h_3} + q_4\cdot\underline{h_4}) + (q_7\cdot\underline{h_7} + q_8\cdot\underline{h_8})$.

Let $\underline{e_{Ra}} = (q_3\cdot\underline{h_3} + q_4\cdot\underline{h_4})$, $\underline{e_{Rb}} = (q_7\cdot\underline{h_7} + q_8\cdot\underline{h_8})$, $\underline{e_a} = \underline{e_{Ra}} + \underline{e_{La}}$ and $\underline{e_b} = \underline{e_{Rb}} + \underline{e_{Lb}}$.

Let $\underline{e_a}^\dagger\cdot\underline{\gamma^0}\cdot\underline{e_a} = J_{0a}$, $\underline{e_a}^\dagger\cdot\underline{\beta^4}\cdot\underline{e_a} = J_{4a}$, $J_{0a} = \underline{e_a}^\dagger\cdot\underline{e_a}\cdot V_{0a}$, $J_{4a} = \underline{e_a}^\dagger\cdot\underline{e_a}\cdot V_{4a}$,

$\underline{e_b}^\dagger\cdot\underline{\gamma^0}\cdot\underline{e_b} = J_{0b}$, $\underline{e_b}^\dagger\cdot\underline{\beta^4}\cdot\underline{e_b} = J_{4b}$, $J_{0b} = \underline{e_b}^\dagger\cdot\underline{e_b}\cdot V_{0b}$, $J_{4b} = \underline{e_b}^\dagger\cdot\underline{e_b}\cdot V_{4b}$.

In this case: $J_0 = J_{0a} + J_{0b}$, $J_4 = J_{4a} + J_{4b}$.

Let $\left(\underline{U}\cdot\underline{e_a}\right)^\dagger\cdot\underline{\gamma^0}\cdot\left(\underline{U}\cdot\underline{e_a}\right) = J'_{0a}$, $\left(\underline{U}\cdot\underline{e_a}\right)^\dagger\cdot\underline{\beta^4}\cdot\underline{\left(\underline{U}\cdot\underline{e_a}\right)} = J'_{4a}$, $J'_{0a} = \left(\underline{U}\cdot\underline{e_a}\right)^\dagger\cdot\left(\underline{U}\cdot\underline{e_a}\right)\cdot V'_{0a}$, $J'_{4a} = \left(\underline{U}\cdot\underline{e_a}\right)^\dagger\cdot\left(\underline{U}\cdot\underline{e_a}\right)\cdot V'_{4a}$,

$\left(\underline{U}\cdot\underline{e_b}\right)^\dagger\cdot\underline{\gamma^0}\cdot\left(\underline{U}\cdot\underline{e_b}\right) = J'_{0b}$, $\left(\underline{U}\cdot\underline{e_b}\right)^\dagger\cdot\underline{\beta^4}\cdot\left(\underline{U}\cdot\underline{e_b}\right) = J'_{4b}$, $J'_{0b} = \left(\underline{U}\cdot\underline{e_b}\right)^\dagger\cdot\left(\underline{U}\cdot\underline{e_b}\right)\cdot V'_{0b}$, $J'_{4b} = \left(\underline{U}\cdot\underline{e_b}\right)^\dagger\cdot\left(\underline{U}\cdot\underline{e_b}\right)\cdot V'_{4b}$.

In this case from (8):

$$\begin{array}{c} V'_{0a} = V_{0a}\cdot\cos(\lambda) + V_{4a}\cdot\sin(\lambda), \\ V'_{4a} = V_{4a}\cdot\cos(\lambda) - V_{0a}\cdot\sin(\lambda); \\ V'_{0b} = V_{0b}\cdot\cos(\lambda) - V_{4b}\cdot\sin(\lambda), \\ V'_{4b} = V_{4b}\cdot\cos(\lambda) + V_{0b}\cdot\sin(\lambda). \end{array}$$

Hence, every isospin transformation divides a electron on two components, which scatter on the angle $2\cdot\lambda$ in the space of (J_0, J_4).

These components are indiscernible in the space of (j_x, j_y, j_z) (7).

Let o be the 2×2 zeros matrix. Let the 4×4 matrices of kind:

$$\left[\begin{array}{cc} P & o \\ o & S \end{array}\right]$$

be denoted as the diagonal matrices, and

$$\left[\begin{array}{cc} o & P \\ S & o \end{array}\right]$$

be denoted as the antidiogonal matrices.

Three diagonal members (β^1, β^2, β^3) of the Clifford pentad define the 3-dimensional space $\Re$, in which u_x, u_y , u_z are located. The physics objects move in this space. Two antidiogonal members (γ^0, β^4) of this pentad define the 2-dimensional space $\grave{A}$, in which V_0 and V_4 are located. The weak isospin transformation acts in this space.

3 GRAVITY

Let x be the particle average coordinate in $\Re$, and $\mathbf{m}$ be the average coordinate of this particle in $\grave{A}$. Let $x + i \cdot \mathbf{m}$ be denoted as the complex coordinate of this particle.

From (6) this particle average velocity, which proportional to $x + i \cdot \mathbf{m}$, is:

$$v = \frac{x + i \cdot \mathbf{m}}{\sqrt{(x^2 + \mathbf{m}^2)}}.$$

$|v| = 1$, but for the acceleration:

$$a = \frac{dv}{dt} = \frac{dv}{dx} \cdot v = -i \cdot \mathbf{m} \cdot \left(\frac{x + i \cdot \mathbf{m}}{x^2 + \mathbf{m}^2} \right)^2.$$

And if $\mathbf{m} \ll x$, then

$$|a| \simeq \frac{\mathbf{m}}{x^2}.$$

This is very much reminds the Newtonian gravity principle (Classical Theories of Gravity).

4 THE CHROMATIC SPACE

Let

$$I = \left[\begin{array}{cc} 1 & 0 \\ 0 & 1 \end{array}\right]$$

and

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, \sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

be the Pauli matrices.
Six Clifford's pentads exists, only:
the red pentad ζ:

$$\zeta^x = \begin{bmatrix} \sigma_x & o \\ o & -\sigma_x \end{bmatrix}, \zeta^y = \begin{bmatrix} \sigma_y & o \\ o & \sigma_y \end{bmatrix}, \zeta^z = \begin{bmatrix} -\sigma_z & o \\ o & -\sigma_z \end{bmatrix},$$

$$\gamma_\zeta^0 = \begin{bmatrix} o & -\sigma_x \\ -\sigma_x & o \end{bmatrix}, \zeta^4 = -i \cdot \begin{bmatrix} o & \sigma_x \\ -\sigma_x & o \end{bmatrix};$$

the green pentad η:

$$\eta^x = \begin{bmatrix} -\sigma_x & o \\ o & -\sigma_x \end{bmatrix}, \eta^y = \begin{bmatrix} \sigma_y & o \\ o & -\sigma_y \end{bmatrix}, \eta^z = \begin{bmatrix} -\sigma_z & o \\ o & -\sigma_z \end{bmatrix},$$

$$\gamma_\eta^0 = \begin{bmatrix} o & -\sigma_y \\ -\sigma_y & o \end{bmatrix}, \eta^4 = i \cdot \begin{bmatrix} o & \sigma_y \\ -\sigma_y & o \end{bmatrix};$$

the blue pentad θ:

$$\theta^x = \begin{bmatrix} -\sigma_x & o \\ o & -\sigma_x \end{bmatrix}, \theta^y = \begin{bmatrix} \sigma_y & o \\ o & \sigma_y \end{bmatrix}, \theta^z = \begin{bmatrix} \sigma_z & o \\ o & -\sigma_z \end{bmatrix},$$

$$\gamma_\theta^0 = \begin{bmatrix} o & -\sigma_z \\ -\sigma_z & o \end{bmatrix}, \theta^4 = -i \cdot \begin{bmatrix} o & \sigma_z \\ -\sigma_z & o \end{bmatrix};$$

the light pentad β:

$$\beta^x = \begin{bmatrix} \sigma_x & o \\ o & -\sigma_x \end{bmatrix}, \beta^y = \begin{bmatrix} \sigma_y & o \\ o & -\sigma_y \end{bmatrix}, \beta^z = \begin{bmatrix} \sigma_z & o \\ o & -\sigma_z \end{bmatrix},$$

$$\gamma^0 = \begin{bmatrix} o & I \\ I & o \end{bmatrix}, \beta^4 = i \cdot \begin{bmatrix} o & I \\ -I & o \end{bmatrix};$$

the sweet pentad $\underline{\Delta}$:

$$\underline{\Delta}^1 = \begin{bmatrix} o & -\sigma_x \\ -\sigma_x & o \end{bmatrix}, \underline{\Delta}^2 = \begin{bmatrix} o & -\sigma_y \\ -\sigma_y & o \end{bmatrix}, \underline{\Delta}^3 = \begin{bmatrix} o & -\sigma_z \\ -\sigma_z & o \end{bmatrix},$$

$$\underline{\Delta}^0 = \begin{bmatrix} -I & o \\ o & I \end{bmatrix}, \underline{\Delta}^4 = i \cdot \begin{bmatrix} o & I \\ -I & o \end{bmatrix};$$

the bitter pentad $\underline{\Gamma}$:

$$\underline{\Gamma}^1 = i \cdot \begin{bmatrix} o & -\sigma_x \\ \sigma_x & o \end{bmatrix}, \underline{\Gamma}^2 = i \cdot \begin{bmatrix} o & -\sigma_y \\ \sigma_y & o \end{bmatrix}, \underline{\Gamma}^3 = i \cdot \begin{bmatrix} o & -\sigma_z \\ \sigma_z & o \end{bmatrix},$$

$$\underline{\Gamma}^0 = \begin{bmatrix} -I & o \\ o & I \end{bmatrix}, \underline{\Gamma}^4 = \begin{bmatrix} o & I \\ I & o \end{bmatrix}.$$

The average velocity vector for the sweet pentad has gotten the following components:

$$V_0^{\underline{\Delta}} = -\cos(2 \cdot a),$$

$$V_1^{\underline{\Delta}} = -\sin(2 \cdot a) \cdot [\cos(b) \cdot \sin(v)\cos(g-q) + \sin(b) \cdot \cos(v)\cos(d-f)],$$

$$V_2^{\underline{\Delta}} = -\sin(2 \cdot a) \cdot [-\cos(b) \cdot \sin(v)\sin(g-q) + \sin(b) \cdot \cos(v)\sin(d-f)],$$

$$V_3^{\underline{\Delta}} = -\sin(2 \cdot a) \cdot [\cos(b) \cdot \cos(v)\cos(g-f) - \sin(b) \cdot \sin(v)\cos(d-q)],$$

$$V_4^{\underline{\Delta}} = -\sin(2 \cdot a) \cdot [-\cos(b) \cdot \cos(v)\sin(g-f) - \sin(b) \cdot \sin(v)\sin(d-q)].$$

Therefore, here the antidiogonal matrices $\underline{\Delta}^1$ and $\underline{\Delta}^2$ define the 2- dimensional space ($V_1^{\underline{\Delta}}$, $V_2^{\underline{\Delta}}$) in which the weak isospin transformation acts. The antidiogonal matrices $\underline{\Delta}^3$ and $\underline{\Delta}^4$ define similar space ($V_3^{\underline{\Delta}}$, $V_4^{\underline{\Delta}}$). The sweet pentad is kept a single diagonal matrix, which defines the one-dimensional space ($V_0^{\underline{\Delta}}$) for the moving of the objects.

Like the sweet pentad, the bitter pentad with four antidiogonal matrices and with single diagonal matrix defines two 2-dimensional spaces, in which the weak isospin transformation acts, and single one-dimensional space for the moving of the objects.

Each chromatic pentad with 3 diagonal matrices and with 2 antidiogonal matrices, like the light pentad, defines single 2-dimensional space, in which the weak isospin interaction acts, and defines single 3-dimensional space for the moving the physics objects.

Let ϕ_3 be any real number and:

$$x' = x \cdot \cos(2 \cdot \phi_3) - y \cdot \sin(2 \cdot \phi_3),$$
$$y' = y \cdot \cos(2 \cdot \phi_3) + x \cdot \sin(2 \cdot \phi_3),$$
$$z' = z.$$

That is the Cartesian frame $\{x', y', z'\}$ is obtained from $\{x, y, z\}$ by the rotation about Z-axis on the angle $2 \cdot \phi_3$.

In this case the velocity coordinates are transformed as the following:

$$\begin{gathered} u'_x = u_x \cdot \cos(2 \cdot \phi_3) + u_y \cdot \sin(2 \cdot \phi_3), \\ u'_y = u_y \cdot \cos(2 \cdot \phi_3) - u_x \cdot \sin(2 \cdot \phi_3), \\ u'_z = u_z \end{gathered} \quad (9)$$

If

$$U_z = -i \cdot \beta^x \cdot \beta^y,\ Q_z(\phi_3) = \cos(\phi_3) \cdot E + i \cdot \sin(\phi_3) \cdot U_z,$$

and

$$\Psi' = Q_z(\phi_3) \cdot \Psi,$$

then the light particles velocity fulfils to (9). And for these particles: $V_0^{\beta\prime} = V_0^{\beta}$, $V_4^{\beta\prime} = V_4^{\beta}$.

Hence, $Q_z(\phi_3)$ coordinates to the Cartesian frame rotation about Z-axis on the angle $2 \cdot \phi_3$, because, if for all ϑ: $\vartheta' = Q_z(\phi_3)^{\dagger} \cdot \vartheta \cdot Q_z(\phi_3)$, then

$$\begin{gathered} \beta^{x\prime} = \beta^x \cdot \cos(2 \cdot \phi_3) - \beta^y \cdot \sin(2 \cdot \phi_3), \\ \beta^{y\prime} = \beta^y \cdot \cos(2 \cdot \phi_3) + \beta^x \cdot \sin(2 \cdot \phi_3), \\ \beta^{z\prime} = \beta^z, \\ \gamma^{0\prime} = \gamma^0, \\ \beta^{4\prime} = \beta^4. \end{gathered}$$

(1).

But

$$\begin{gathered} \zeta^{x\prime} = \zeta^x \cdot \cos(2 \cdot \phi_3) + \eta^y \cdot \sin(2 \cdot \phi_3), \\ \eta^{y\prime} = \eta^y \cdot \cos(2 \cdot \phi_3) - \zeta^x \cdot \sin(2 \cdot \phi_3), \\ \zeta^{y\prime} = \zeta^y \cdot \cos(2 \cdot \phi_3) + \eta^x \cdot \sin(2 \cdot \phi_3), \\ \eta^{x\prime} = \eta^x \cdot \cos(2 \cdot \phi_3) - \zeta^y \cdot \sin(2 \cdot \phi_3), \\ \gamma_\zeta^{0\prime} = \gamma_\zeta^0 \cdot \cos(2 \cdot \phi_3) + \gamma_\eta^0 \cdot \sin(2 \cdot \phi_3), \\ \gamma_\eta^{0\prime} = \gamma_\eta^0 \cdot \cos(2 \cdot \phi_3) - \gamma_\zeta^0 \cdot \sin(2 \cdot \phi_3), \\ \zeta^{4\prime} = \zeta^4 \cdot \cos(2 \cdot \phi_3) - \eta^4 \cdot \sin(2 \cdot \phi_3), \\ \eta^{4\prime} = \eta^4 \cdot \cos(2 \cdot \phi_3) + \zeta^4 \cdot \sin(2 \cdot \phi_3). \end{gathered}$$

That is the red pentad and the green pentad are confounded on the angle $2 \cdot \phi_3$ in their space under the Cartesian frame rotation about Z-axis on this angle. Nevertheless, the triplet

$$\left\{\begin{array}{c}\zeta^{x}+\eta^{x}+\theta^{x}\\ -\zeta^{y}+\eta^{y}-\theta^{y}\\ \zeta^{z}+\eta^{z}+\theta^{z}\end{array}\right\}$$

behaves like the vector:

$$\begin{gathered}\left(\zeta^{x}+\eta^{x}+\theta^{x}\right)'=\\ =\left(\zeta^{x}+\eta^{x}+\theta^{x}\right)\cdot\cos\left(2\cdot\phi_{3}\right)+\left(-\zeta^{y}+\eta^{y}-\theta^{y}\right)\cdot\sin\left(2\cdot\phi_{3}\right),\\ \left(-\zeta^{y}+\eta^{y}-\theta^{y}\right)'=\\ =\left(-\zeta^{y}+\eta^{y}-\theta^{y}\right)\cdot\cos\left(2\cdot\phi_{3}\right)-\left(\zeta^{x}+\eta^{x}+\theta^{x}\right)\cdot\sin\left(2\cdot\phi_{3}\right),\\ \left(\zeta^{z}+\eta^{z}+\theta^{z}\right)'=\zeta^{z}+\eta^{z}+\theta^{z}.\end{gathered}$$

This triplet is denoted as the hadron monad (Confinement).

5 OTHER ROTATIONS OF THE CARTESIAN FRAME

The Cartesian frame rotation about Y-axis:

Let ϕ_2 be any real number and:

$$U_{y}=-i\cdot\beta^{z}\cdot\beta^{x},\ Q_{y}\left(\phi_{2}\right)=\cos\left(\phi_{2}\right)\cdot E+i\cdot\sin\left(\phi_{2}\right)\cdot U_{y}.$$

Let for all ϑ: $\vartheta'=Q_{y}\left(\phi_{2}\right)^{\dagger}\cdot\vartheta\cdot Q_{y}\left(\phi_{2}\right)$.

In this case for light pentad:

$$\begin{gathered}\beta^{x\prime}=\beta^{x}\cdot\cos\left(2\cdot\phi_{2}\right)-\beta^{z}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \beta^{y\prime}=\beta^{y}\\ \beta^{z\prime}=\beta^{z}\cdot\cos\left(2\cdot\phi_{2}\right)+\beta^{x}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \gamma^{0\prime}=\gamma^{0},\\ \beta^{4\prime}=\beta^{4}.\end{gathered}$$

For chromatic pentads:

$$\begin{gathered}\zeta^{x\prime}=\zeta^{x}\cdot\cos\left(2\cdot\phi_{2}\right)-\theta^{z}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \theta^{z\prime}=\theta^{z}\cdot\cos\left(2\cdot\phi_{2}\right)+\zeta^{x}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \theta^{x\prime}=\theta^{x}\cdot\cos\left(2\cdot\phi_{2}\right)-\zeta^{z}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \zeta^{z\prime}=\zeta^{z}\cdot\cos\left(2\cdot\phi_{2}\right)+\theta^{x}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \zeta^{y\prime}=\zeta^{y},\\ \theta^{y\prime}=\theta^{y},\\ \gamma_{\zeta}^{0\prime}=\gamma_{\zeta}^{0}\cdot\cos\left(2\cdot\phi_{2}\right)-\gamma_{\theta}^{0}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \gamma_{\theta}^{0\prime}=\gamma_{\theta}^{0}\cdot\cos\left(2\cdot\phi_{2}\right)+\gamma_{\zeta}^{0}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \zeta^{4\prime}=\zeta^{4}\cdot\cos\left(2\cdot\phi_{2}\right)-\theta^{4}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \theta^{4\prime}=\theta^{4}\cdot\cos\left(2\cdot\phi_{2}\right)+\zeta^{4}\cdot\sin\left(2\cdot\phi_{2}\right),\\ \gamma_{\eta}^{0\prime}=\gamma_{\eta}^{0},\\ \eta^{4\prime}=\eta^{4},\\ \eta^{y\prime}=\eta^{y}.\end{gathered}$$

For the hadron monad:

$$\left(\zeta^x + \eta^x + \theta^x\right)' = \left(\zeta^x + \eta^x + \theta^x\right) \cdot \cos\left(2 \cdot \phi_2\right) - \left(\zeta^z + \eta^z + \theta^z\right) \cdot \sin\left(2 \cdot \phi_2\right),$$
$$\left(-\zeta^y + \eta^y - \theta^y\right)' = \left(-\zeta^y + \eta^y - \theta^y\right),$$
$$\left(\zeta^z + \eta^z + \theta^z\right)' = \left(\zeta^z + \eta^z + \theta^z\right) \cdot \cos\left(2 \cdot \phi_2\right) + \left(\zeta^x + \eta^x + \theta^x\right) \cdot \sin\left(2 \cdot \phi_2\right).$$

The Cartesian frame rotation about X-axis:
Let ϕ_1 be any real number and:

$$U_x = -i \cdot \beta^y \cdot \beta^z,\ Q_x\left(\phi_1\right) = \cos\left(\phi_1\right) \cdot E + i \cdot \sin\left(\phi_1\right) \cdot U_x.$$

Let for all ϑ: $\vartheta' = Q_y\left(\phi_1\right)^\dagger \cdot \vartheta \cdot Q_y\left(\phi_1\right)$.
In this case for light pentad:

$$\begin{aligned}
\beta^{x\prime} &= \beta^x \\
\beta^{y\prime} &= \beta^y \cdot \cos\left(2 \cdot \phi_1\right) + \beta^z \cdot \sin\left(2 \cdot \phi_1\right), \\
\beta^{z\prime} &= \beta^z \cdot \cos\left(2 \cdot \phi_1\right) - \beta^y \cdot \sin\left(2 \cdot \phi_1\right), \\
\gamma^{0\prime} &= \gamma^0, \\
\beta^{4\prime} &= \beta^4.
\end{aligned}$$

For chromatic pentads (QCD):

$$\begin{aligned}
\eta^{y\prime} &= \eta^y \cdot \cos\left(2 \cdot \phi_1\right) + \theta^z \cdot \sin\left(2 \cdot \phi_1\right), \\
\theta^{z\prime} &= \theta^z \cdot \cos\left(2 \cdot \phi_1\right) - \eta^y \cdot \sin\left(2 \cdot \phi_1\right), \\
\theta^{y\prime} &= \theta^y \cdot \cos\left(2 \cdot \phi_1\right) - \eta^z \cdot \sin\left(2 \cdot \phi_1\right), \\
\eta^{z\prime} &= \eta^z \cdot \cos\left(2 \cdot \phi_1\right) + \theta^y \cdot \sin\left(2 \cdot \phi_1\right), \\
\eta^{x\prime} &= \eta^x, \\
\theta^{x\prime} &= \theta^x, \\
\gamma_\eta^{0\prime} &= \gamma_\eta^0 \cdot \cos\left(2 \cdot \phi_1\right) + \gamma_\theta^0 \cdot \sin\left(2 \cdot \phi_1\right), \\
\gamma_\theta^{0\prime} &= \gamma_\theta^0 \cdot \cos\left(2 \cdot \phi_1\right) - \gamma_\eta^0 \cdot \sin\left(2 \cdot \phi_1\right), \\
\eta^{4\prime} &= \eta^4 \cdot \cos\left(2 \cdot \phi_1\right) - \theta^4 \cdot \sin\left(2 \cdot \phi_1\right), \\
\theta^{4\prime} &= \theta^4 \cdot \cos\left(2 \cdot \phi_1\right) + \eta^4 \cdot \sin\left(2 \cdot \phi_1\right), \\
\gamma_\zeta^{0\prime} &= \gamma_\zeta^0, \\
\zeta^{4\prime} &= \zeta^4, \\
\zeta^{y\prime} &= \zeta^y.
\end{aligned}$$

For the hadron monad:

$$\left(\zeta^x + \eta^x + \theta^x\right)' = \left(\zeta^x + \eta^x + \theta^x\right),$$
$$\left(-\zeta^y + \eta^y - \theta^y\right)' =$$
$$= \left(-\zeta^y + \eta^y - \theta^y\right) \cdot \cos\left(2 \cdot \phi_1\right) + \left(\zeta^z + \eta^z + \theta^z\right) \cdot \sin\left(2 \cdot \phi_1\right),$$
$$\left(\zeta^z + \eta^z + \theta^z\right)' =$$
$$= \left(\zeta^z + \eta^z + \theta^z\right) \cdot \cos\left(2 \cdot \phi_1\right) - \left(-\zeta^y + \eta^y - \theta^y\right) \cdot \sin\left(2 \cdot \phi_1\right).$$

For all the Cartesian frame rotations - the chromatic pentads are confounded, but the hadron monad behaves like the vector.

Therefore, the hadron current vector has got the following Cartesian coordinates:

$$j_x = \Psi^\dagger \cdot (\zeta^x + \eta^x + \theta^x) \cdot \Psi,$$
$$j_y = \Psi^\dagger \cdot (-\zeta^y + \eta^y - \theta^y) \cdot \Psi,$$
$$j_z = \Psi^\dagger \cdot (\zeta^z + \eta^z + \theta^z) \cdot \Psi.$$

6 OTHER ROTATIONS

Let us construct the rotation in the red and green pentads space like U_x, U_y, U_z:

Let $U_0 = -i \cdot \gamma_\zeta^0 \cdot \gamma_\eta^0$. Turned out to be, that $.U_0 = U_z$. Hence, this rotation is the Cartesian frame rotation. The same for the other rotations into the chromatic pentads space.

But the rotation with the light and the chromatic pentads does not exist.

7 RESUME

Single light Clifford pentad and three chromatic ones define the particles properties.

The weak isospin transformation corresponds to the rotation of the antidiogonal Clifford matrices space.

The Newtonian gravity principle is the result of the sectioning of the 5-dimensional space on the 3-dimensional subspace $\Re$ and the 2-dimensional subspace $\grave{A}$.

The Cartesian frame rotations confound the chromatic pentads, but some these pentads combination exists, which behaves as the vector under these rotations.